

Instructions: Study this homework as we progress if you want to feel ready for the first exam, on 02/17.

## 1 Short Questions

1. Briefly describe what a format specifier is. Write a statement that uses one.
2. Indicate the order of evaluation of the operators in each of the following operations by adding parenthesis or developing the expression one step at a time, and compute the resulting value:

(a)  $3 * 4 - 2$

(b)  $3 \% 2 + 3$

(c)  $2 - 3 + 3 * 2$

(d)  $2 + 2 * 1 - 4$

3. What is "an instance of a class"?
4. Give two access modifiers.
5. What, if any, is the difference between a parameter and an argument?
6. Write a statement that creates a new object from the `Rectangle` class.
7. What is the purpose of the keyword `new`?
8. Do different objects from the same class share their instance variables?
9. Briefly explain the difference between a local variable and an instance variable.
10. Suppose we have a `Circle` class containing

```
public void SetRadius(double radiusArgument)
{
    radius = radiusArgument;
}
```

Write a statement that create a `Circle` object, and one statement that sets its radius to 3.5.

11. What does the keyword `return` do?
12. Write a get method for an instance variable named `total` of type `int`.
13. Write a getter for an attribute of type `string` named `myName`.
14. Write a setter for an attribute of type `int` named `myAge`.
15. Assuming `name` is a `string` instance variable, there is problem with the following setter. Fix it.

```
public int SetName(string val){
    name = val;
}
```

16. Write a method for the `Rectangle` class that divides the length and width of the calling object by a factor given as a parameter.
17. Draw the UML diagram of a class named "Student" with a single attribute, "name", of type `string`, and two methods, `SetName` and `GetName`.
18. Write a `ToString` method for a `Account` class with two attributes, a `string` attribute called `name` and a `decimal` attribute called `amount`.

19. Consider the following UML diagram:

Circle
- radius : float
+ setRadius(radiusParam : float) : void
+ getRadius(): float
+ getArea(): float

What is the name of the class, what are the methods and attributes of the class?

20. What does it mean to say that instance variables have a default initial value? How is that different from the variables we have been manipulating in the Main method?
21. Is it possible to have more than one constructor defined for a class? If yes, how can we know which one is called?
22. What is the name of a constructor method? What is the return type of a constructor?
23. Write a constructor for a Soda class with one `string` attribute called `name`.
24. Assume we have a Polygon class, that have only one attribute, an `int` called `numberOfSides`. Write a constructor for that class.
25. What is the "default" constructor? Do we always have the possibility of using it?
26. What is the return type of a `ToString` method? How many arguments does it usually take?
27. Consider the following partial class definition:

```
public class Book
{
    private string title;
    private string author;
    private string publisher;
    private int copiesSold;
}
```

- (a) Write a statement that would create a `Book` object.
- (b) Write a "getter" and a "setter" for the `title` attribute.
- (c) Write a constructor for the `Book` class taking at least one argument (you are free to decide which one(s)).
28. Assume that my `Pet` class contains one custom constructor

```
public Pet(string nameP, char genderP){
    name = nameP;
    gender = genderP;
}
```

What is the problem with the following statement? `Pet myPet = new Pet('M', "Bob");`

29. Why would one want to define a constructor for a class?

## 2 Problems

There is only one problem this time, and it is harder than what you'll be asked to do during the exam, and it does **not** require a computer. Being able to solve it is an excellent sign that you are ready.

1. You are going to design a class named `Triangle`. A triangle has three angles, but knowing the value of only two angles is sufficient to determine the value of the third<sup>1</sup> since they always add up to  $180^\circ$ . Hence, it is sufficient to have only two `double` attributes, `angle1` and `angle2`. We want to define several methods:
  - a no-arg constructor that sets the value of `angle1` to 60.0 and the value of `angle2` to 60.0,
  - another constructor, that takes two arguments, and assigns to `angle1` the value of the first argument, and assigns to `angle2` the value of the second argument,
  - getters for `angle1` and `angle2`,
  - a method that computes and returns the value of the third angle, that we name `ComputeAngle3`,
  - a method that rotate the triangle: the value of the first angle should be replaced with the value of the second angle, and the value of the second angle should be replaced with the value of the third angle.
- (a) Write the UML diagram for the `Triangle` class.
- (b) Write the full, compilable implementation of the `Triangle` class.

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<sup>1</sup>This is similar to the `Rectangle` class, where there is no need to store the perimeter or area, since we can always compute those when needed from the `width` and `length` parameters.,